Dwarfism in Heterocera — physiological response to climatic change in mid-Wales 1989.

The climate in 1989 in the United Kingdom was the warmest for 330 years but subject to considerable fluctuations, not least in west Wales. Observations in north Cardiganshire at Cnwch Coch, near Aberystwyth confirmed the average difference between night and day temperatures were of the order of −0.6°C. (31°F.) the greatest difference recorded was −0.6°C. (31°F.) from overnight on 27th and midday on 28th May, when it was 25°C. (37°F.). At Cnwch Coch, the average maximum day temperature in May, for the last three years has progressively increased 14.4°C. (58°F.) in 1987; 17.8°C. (64°F.) in 1988; 9.5°C. (67.7°F.) in 1989 and in London on 23rd, 29°C. (84°F.) was the hottest for thirty-six years. This warmer than average climate continued and still prevails.

On 21st June 1989 some County Councils banned the use of hosepipes in Wales as water levels in reservoirs continued to fall, in many parts of England. July 1988 was the wettest for twenty years. July 1989 was quite the opposite, only six days of measurable rainfall at Cnwch Coch, with a trace on a further three days resulting in 38mm (average 87mm 1941-70). In August and September there was little difference in the number of days when rain fell but again, amounts were well below average 92.2mm (average 104mm). Soil moisture continued to fall as the ground cracked and herbage wilted.

Hours of sunshine for August were the highest ever recorded. June, 186 hours (average 185 hours); July, 219.8 hours (average 160.4 hours); August, 193.8 hours (average 155.2 hours). Average temperatures remained very high at Cnwch Coch, June 20°C. (68.5°F.); July, 26°C., (86.7°F.), August, 21°C. (70°F.); September, 18.5°C. (65.5°F.).

Table 1. 1989 Monthly temperatures‡

	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Soil temp. at 30 cm.	13.55	15.73	18.39	17.32	15.58
averages 1951-1980	10.9	13.8	15.4	15.6	14.4
Maximum temp.	17.42	18.65	21.82	19.29	17.77
averages 1951-1980	15.3	17.9	19.0	19.1	17.3

‡Data supplied by Agromet Dept. MAFF, ADAS, for nearby Trawscoed Experimental Husbandry Farm.

In spite of high temperatures there was no indication of forwardness in the time of appearance of moths but the number of species trapped in September was more than in some previous years — 1981 (11); 1982 (6);

1989 (24) — but the number of specimens trapped was less than usual for the month 1981 (50); 1989 (40). More interestingly, some moths were noticeably smaller than usual. Measuring the distance from the centre of the thorax to the apex of the forewing × 2 new minima in the size of the following species of moths were established.

Table 2

NEW MINIMAL WING EXPANSE IN SOME HETEROCERA

Species	Date	Min. Wing expanse mm.	Min. Wing expanse mm. (Skinner 1984)*
Flame Carpet *Xanthorhoe designata* Hufn.	4.ix.	22	25
Purple Bar *Cosmorhoe ocellata* L.	27.viii.	26	28
Small Phoenix *Acliptopera silaceata* D & S	29.vii.	28	29
Grey Pine Carpet *Thera obeliscata* Hb.	27.ix.	26	28
Brimstone Moth *Opisthograptis luteolata* L.	25.ix.	32	33
Early Thorn *Selenia dentaria* F.	23.ix.	36	40
Light Emerald *Campaea margaritata* L.	29.vi.	38	42
Centre-barred Sallow *Atethmia centrago* Haw.	31.viii.	30	32

Some species of Heterocera not emerging until the following spring were similarly affected by dwarfism.

Table 3

Species	Date	Min. Wing expanse mm.	Min. Wing expanse mm. (Skinner 1984)*
Shoulder Stripe *Anticlea badiata* D. & S.	22.iv.90	28	31
Small Quaker *Orthosia cruda* D. & S.	26.iii.90	26	28
Clouded Drab *Orthosia incerta* (Hufn.)	13.iv.90	32	34
Sword-grass *Xylena exoleta* L.	13.iv.90	52	55

*Skinner, B. (1984) *Colour identification guide to moths of the British Isles.* Viking.

High temperatures, above average hours of sunshine, a soil moisture deficit caused a severe check in plant growth in some shallow rooted herbs and dessication would have adversely affected feeding and development of some moth larvae, resulting in dwarfism.— PHILIP M. MILES, Werndeg, Cnwch Coch, Aberystwyth, Dyfed, Wales.